

GUIDELINE FOR HOME STUDIES

SUBJECT: MECHANOTECHNICS N4

PRESCRIBE BOOK: MECHANOTECHNICS N4 RD JOUBERT



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087 913 1333

MECHANOTECHNICS N4 (10 Week Guideline)

WEEK		WEEK	
1	<ol style="list-style-type: none"> 1. WORKSHOP LAYOUT 2. Poor & Good Workshop layout. 3. Principles & Important factors. 4. Requirements & procedures. 	2	<ol style="list-style-type: none"> 1. BELT DRIVES 2. V Belt Flat Belt & Conveyer belt. 3. How they apply Power 4. Application in the Factories .
3	<ol style="list-style-type: none"> 1. Metal Cutting Machines. 2. Different Types. Tools 3. Force and Pressure 4. Determine the Power 	4	<ol style="list-style-type: none"> 1. Corrosion 2. Few Materials are indestructible 3. Definition of corrosion 4. Methods to protect materials against corrosion
5	<ol style="list-style-type: none"> 1. PRECISION 2. Precise calculations 3. Precise Instruments 4. Concepts of terminology 	6	<ol style="list-style-type: none"> 1. BEARINGS Journal or plain 2. Capillarity 3. Lubricants 4. Anti Friction .
7	<ol style="list-style-type: none"> 1. GEAR DRIVES 2. Gear Trains 3. Epicyclic 4. Terminology 	8	<ol style="list-style-type: none"> 1. Hydraulic Systems 2. Bernoulli's 3. FLOW 4. VENTURI FLOW METER
9	<ol style="list-style-type: none"> 1. HYDRAULICS 2. Calculations. 3. Chezy's Formula 4. Darcy's Formula 	10	OLD EXAM Question Papers With MEMO

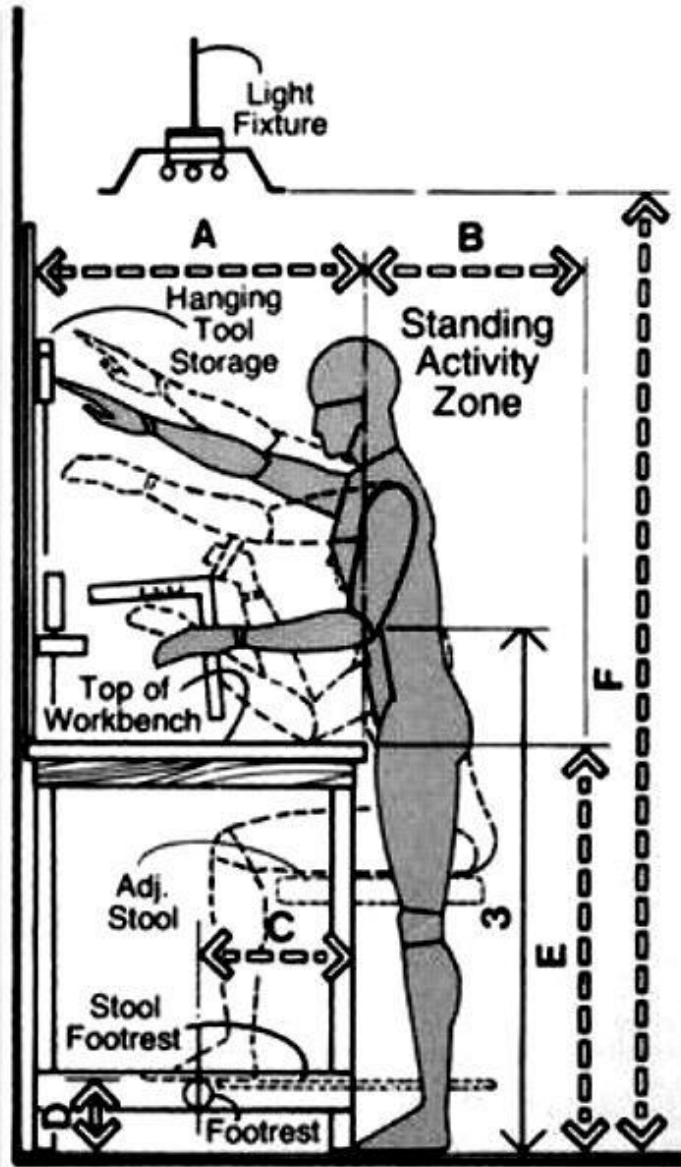
WEEK 1

1.WORKSHOP LAYOUT

TASK 1.	(2 days)	Read and study from	page 2 to 15
TASK 2.	(2 days)	Do Exercise 1	page 16
TASK 3.	(1 days)	Draw ALL sketches in MODULE 1	
		For learning the Construction of the Sketches.	

1. WORKSHOP LAYOUT
2. Poor & Good Workshop layout.
3. Principles & Important factors.
4. Requirements & procedures.

Extra work study following information



WEEK 2

2.BELT DRIVES

TASK 1. (2 days)	Read and study from	page 19 to 56
TASK 2. (2 days)	Do Exercise 2	page 40
TASK 3. (1 days)	Draw ALL sketches in MODULE 2	
	For learning the Construction of the Sketches.	

Extra work study following information

1. BELT DRIVES
2. V Belt Flat Belt & Conveyer belt.
3. How they apply Power
4. Application in the Factories .

Advantages of belt drives:

Belt drives are simple are economical.

They don't require parallel shafts.

Belts drives are provided with overload and jam protection.

Noise and vibration are damped out. Machinery life is increased because load fluctuations are shock-absorbed.

They are lubrication-free. They require less maintenance cost.

Belt drives are highly efficient in use (up to 98%, usually 95%).

They are very economical when the distance between shafts is very large.

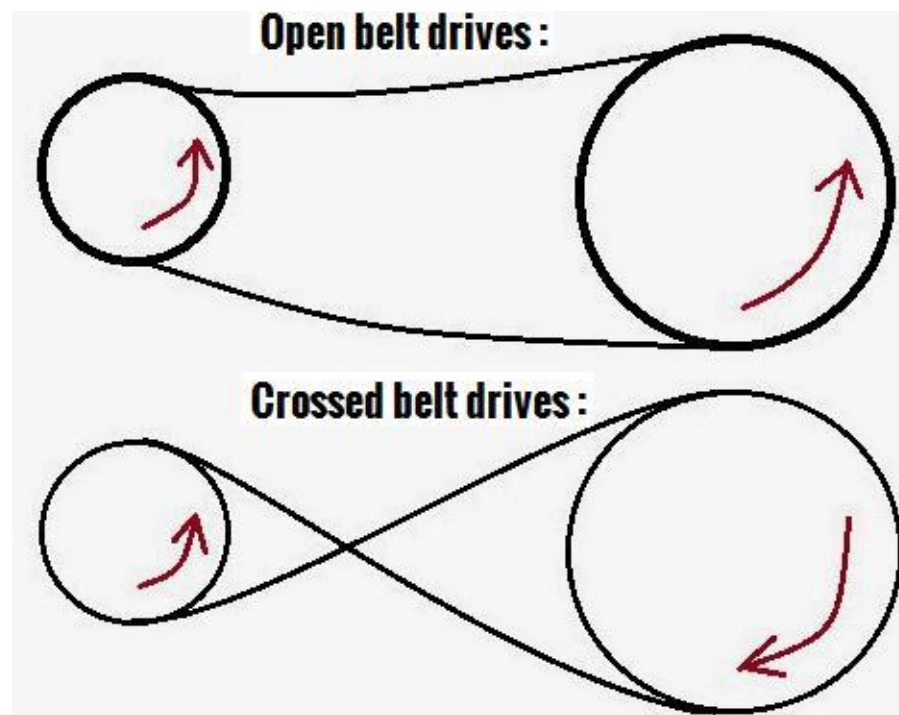
Disadvantages of belt drives:

In Belt drives, angular velocity ratio is not necessarily constant or equal to the ratio of pulley diameters, because of slipping and stretching.

Heat buildup occurs. Speed is limited to usually 35 meters per second. Power transmission is limited to 370 kilowatts.

Operating temperatures are usually restricted to -35 to 85°C .

Some adjustment of center distance or use of an idler pulley is necessary for wearing and stretching of belt drive compensation.



WEEK 3

3. METAL Cutting Machines

TASK 1.	(2 days)	Read and study from	page 47 to 63
TASK 2.	(2 days)	Do Exercise 3	page 63
TASK 3.	(1 days)	Draw ALL sketches in MODULE 3 For learning the Construction of the Sketches.	

Extra work study following information

1. Metal Cutting Machines.
2. Different Types. Tools
3. Force and Pressure
4. Determine the Power



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Precision Right.



WEEK 4

4. CORROSION

TASK 1.	(2 days)	Read and study from	page 85 to 101
TASK 2.	(2 days)	Do Exercise 4	page 102
TASK 3.	(1 days)	Draw ALL sketches in MODULE 4 For learning the Construction of the Sketches.	

1. Corrosion
2. Few Materials are indestructible
3. Definition of corrosion
4. Methods to protect materials against corrosion

Extra work study following information.



WEEK 5

5. PRECISION

TASK 1. (2 days)	Read and study from	page 104 to 159
TASK 2. (2 days)	Do Exercises 5.1(p128) 5.2(p142) 5.3(p152) 5.4(p158)	
TASK 3 . (1 days)	Draw ALL sketches in MODULE 5	
	For learning the Construction of the Sketches.	

Extra work study following information.

1. PRECISION
2. Precise calculations
3. Precise Instruments
4. Concepts of terminology

PRECISION Definition

<http://www.dictionary.com/browse/precision>

1. the state or quality of being precise.
2. accuracy; exactness: to arrive at an estimate with precision.
3. mechanical or scientific exactness: a lens ground with precision.
4. punctiliousness; strictness: precision in one's business dealings.
5. Mathematics. the degree to which the correctness of a quantity is expressed. Compare accuracy (def 6).
6. Chemistry, Physics. the extent to which a given set of measurements of the same sample agree with their mean. Compare accuracy (def 2).

WEEK 6

6.BEARINGS

TASK 1.	(2 days)	Read and study from	Page 159 to 195
TASK 2.	(2 days)	Do Exercise 6	Page 196
TASK 3.	(1 days)	Draw ALL Sketches freehand for	MODULE 6
For learning the Construction of the SKETCHES			

Extra work study following information.

1. BEARINGS Journal or plain
2. Capillarity
3. Lubricants
4. Anti Friction .



<http://www.mech-seal.co.za/?cat=44>



Bearing

TYPES

Deep Groove Ball Bearing
Aligning Roller Bearing
Tapered Roller Bearing
Aligning Ball Bearing
Angular Contact Ball Bearing
Outer Spherical



WEEK 7

7. GEAR DRIVES

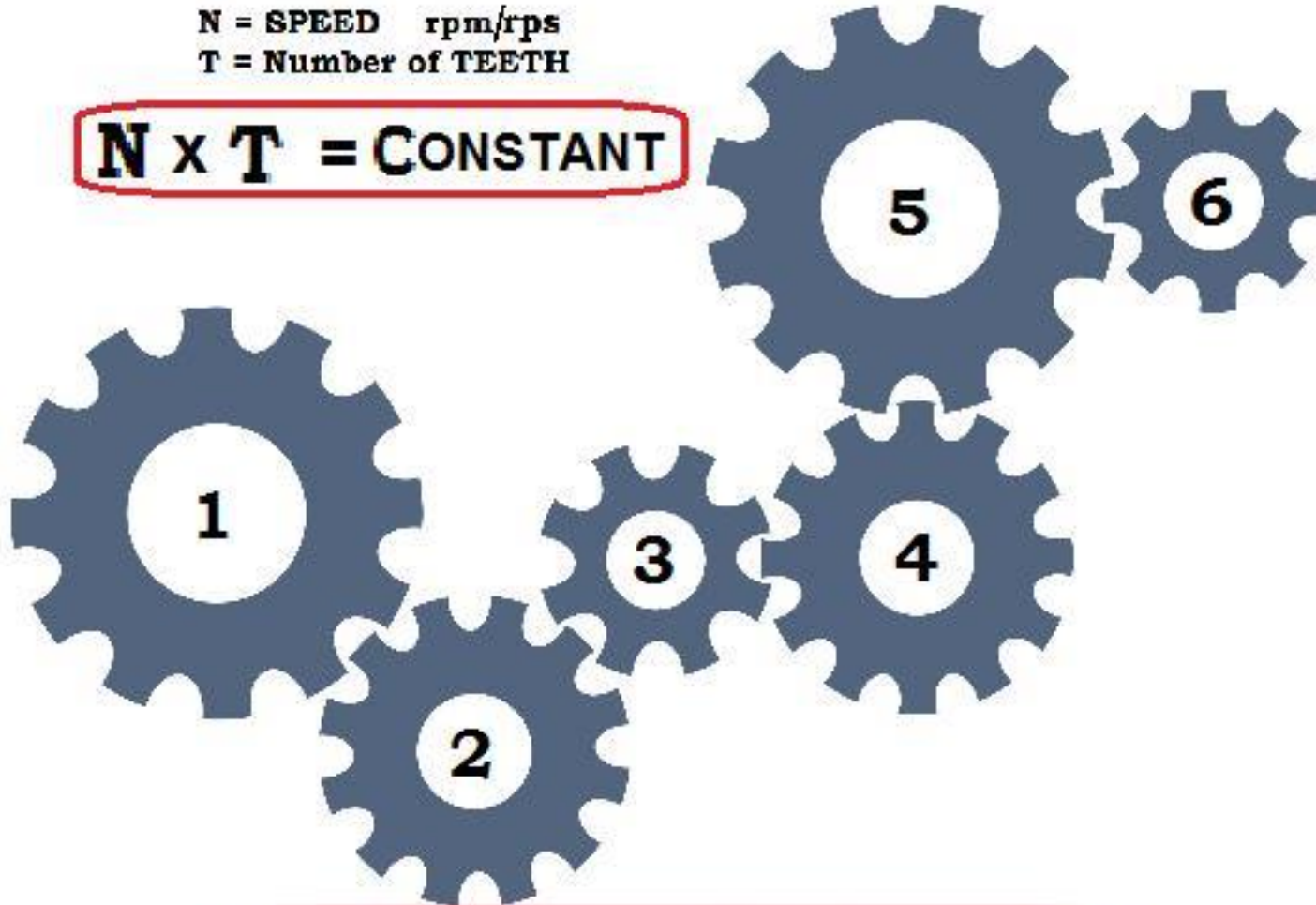
TASK 1.	(2 days)	Read and study from	page 197 to 233
TASK 2.	(2 days)	Do Exercise	7.1(p214) 7.2(p228)
TASK 3.	(1 days)	Draw ALL Sketches freehand for an Exercise. For learning the Construction of the Instruments.	

Extra work study following information.

1. GEAR DRIVES
2. Gear Trains
3. Epicyclic
4. Terminology

N = SPEED rpm/rps
T = Number of TEETH

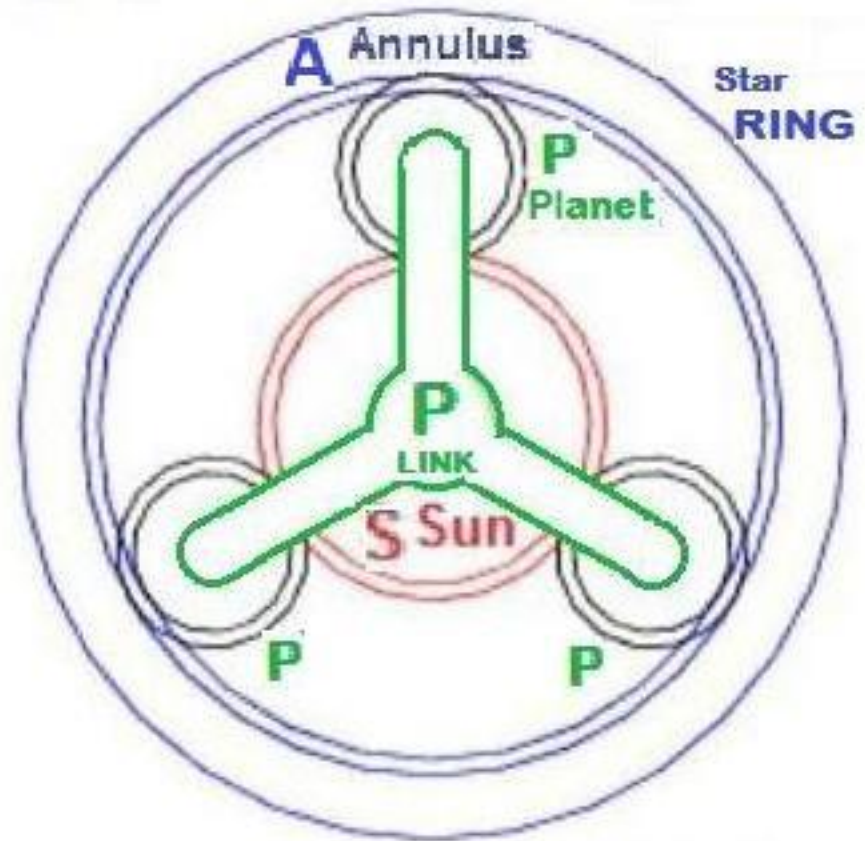
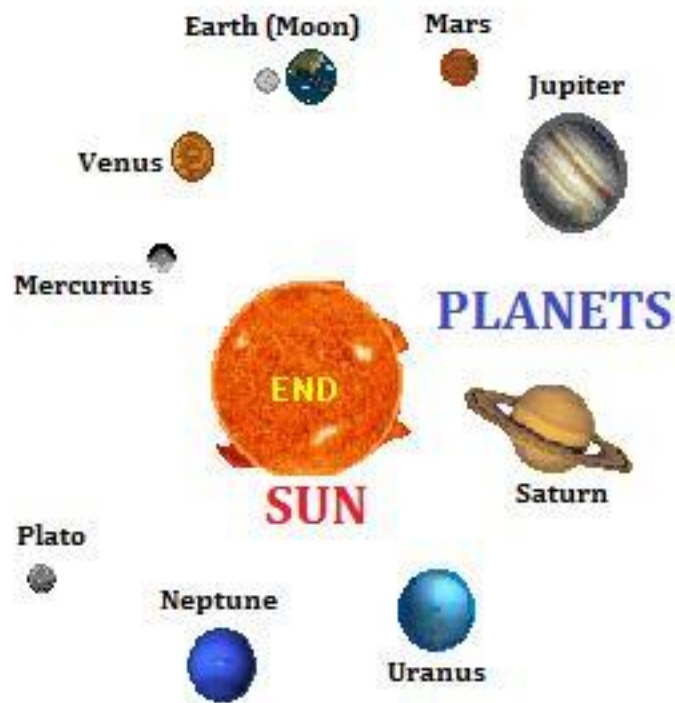
$$\mathbf{N \times T = CONSTANT}$$



$$N_1 T_1 = N_2 T_2 = N_3 T_3 = N_4 T_4 = N_5 T_5 = N_6 T_6$$

<http://www.clipartkid.com/gears-cliparts/>

Epicyclic Gear Arrangement



EPICYCLE (Automatic Gearbox)

Main Formula

$$(A + S) N_P = A N_A + S N_S$$

$$A = 2P + S$$

WHERE A = ANALUS NUMBER OF TEETH

S = SUN NUMBER OF TEETH

AND P = PLANET NUMBER OF TEETH

N = SPEED (RPM) OR (RPS)

Eliminate FIX Gear speed N as zero
Substitute in Main formula.

$$(A + S)N_P = AN_A + SN_S$$

FIX RINGGEAR $(A + S)N_P = SN_S$

FIX SUNGEAR $(A + S)N_P = AN_A$

FIX PLANETGEARS $0 = AN_A + SN_S$

WEEK 8

8. HYDRAULIC SYSTEMS

TASK 1.	(2 days)	Read and study from	page 233 to 261
TASK 2.	(2 days)	Do Exercises	8.1(p244) 8.2(p259)
TASK 3.	(1 days)	Draw ALL Sketches freehand for MODULE 8. For learning the Construction of the Sketches	

Extra work study following information.

1. Hydraulic Systems
2. Bernoulli's
3. FLOW
4. VENTURI FLOW METER

$$\frac{P_1}{\rho} + \frac{V_1^2}{2} + gh_1 = \frac{P_2}{\rho} + \frac{V_2^2}{2} + gh_2$$

BERNOULI's THEOREM

In any close loop the TOTAL Energy is CONSTANT At any point :
Pressure Energy + Kinetic Energy + Potential Energy + Heat Energy = Constant

$$\text{Pr.E.} + \text{K.E.} + \text{P.E.} + \text{H.E.} = \text{Constant}$$

$$\frac{P m}{\rho} + \frac{1}{2} m v^2 + mgh + m\alpha\Delta T = \text{Constant}$$

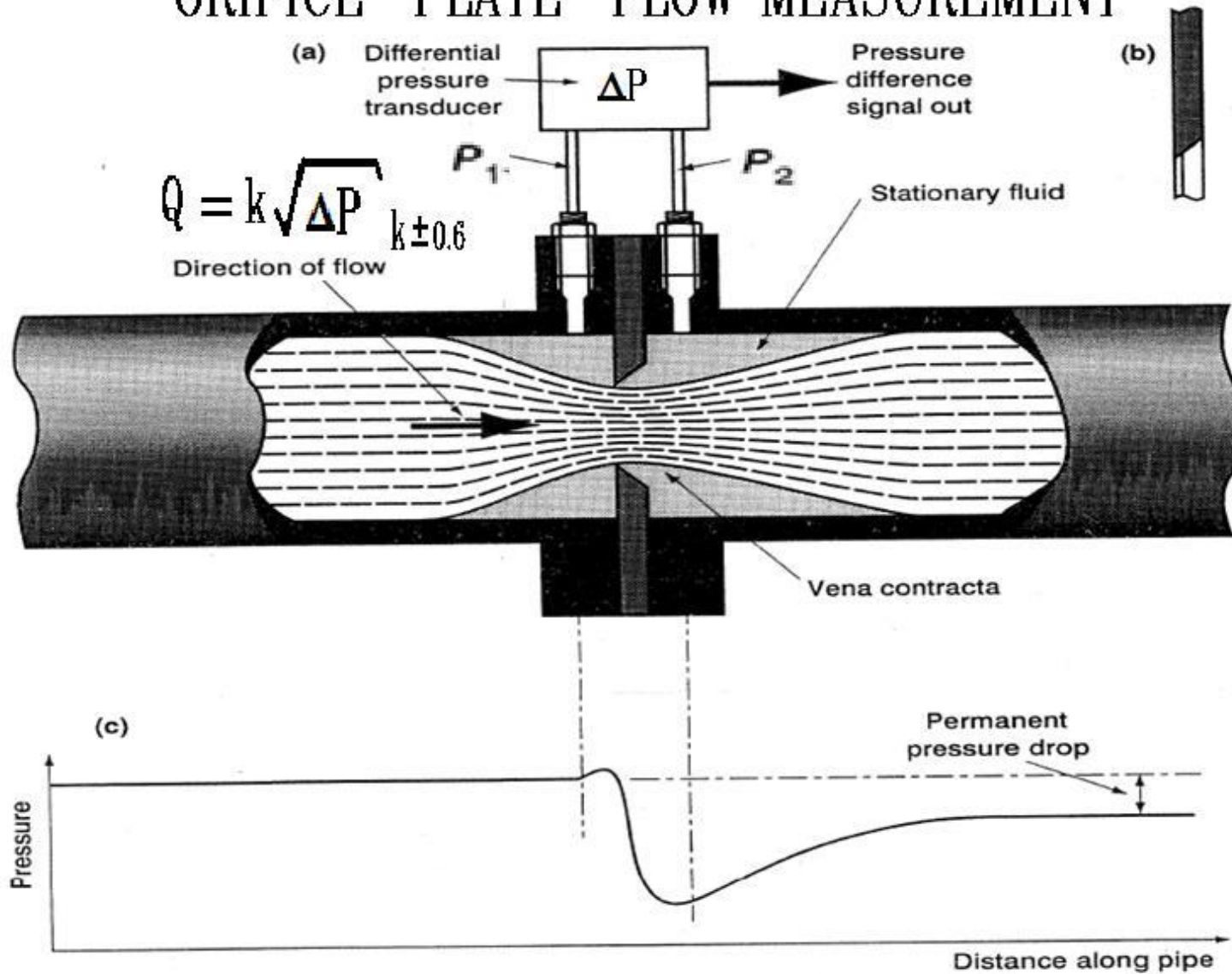
$$\Delta T \sim 0$$

$$\frac{P m}{\rho} + \frac{1}{2} m v^2 + mgh = \text{Constant}$$

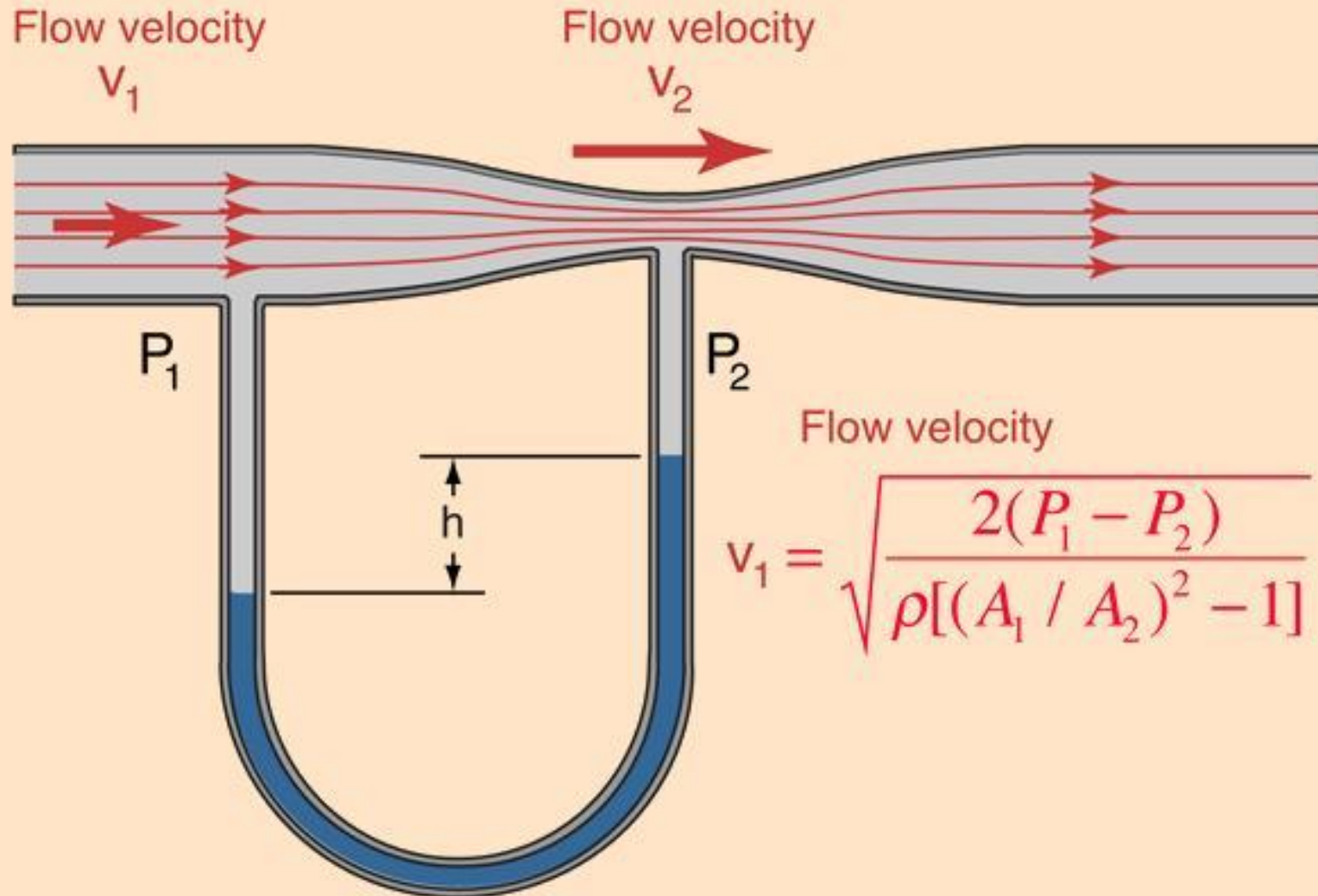
Devide by m:

$$\frac{P}{\rho} + \frac{v^2}{2} + gh = \text{Constant}$$

ORIFICE PLATE FLOW MEASUREMENT



Venturi Flowmeter



WEEK 9

9. HYDRAULICS

TASK 1.	(2 days)	Read and study from	page 261 to 279
TASK 2.	(2 days)	Do Exercise 9	page 280
TASK 3.	(1 days)	Draw ALL Sketches freehand for MODULE 8. For learning the Construction of the Sketches	

Extra work study following information.

1. HYDRAULICS
2. Calculations.
3. Chezy's Formula
4. Darcy's Formula

CHEZY'S Formula: and Darcy's Formula:

An equation for calculating the average velocity of water flowing in an open channel.

Chezy $v = C\sqrt{mi}$ $i = \frac{H_f}{l}$ $C = \sqrt{\frac{2g}{f}}$

$$m = \frac{\text{Area (pipe)}}{\text{Circumference}} = \frac{\frac{\pi d^2}{4}}{\pi d} = \frac{d}{4}$$

Darzy $h_f = \frac{4 \times f \times l \times v^2}{2 \times g \times d}$

$$h_f = \frac{f \times l \times Q^2}{3,026 \times d^5}$$

$i = \text{gradient}$
 $l = \text{length of pipe}$
 $f = \text{Friction}$
 $C = \text{Chezy Constant}$
 $d = \text{Pipe Diameter}$
 $Q = \text{Flow } m^3 / s$
 $H_f = \text{Head } m$

WEEK 10

OLD EXAM QUESTIONS REVISION

TASK 1- 5 (5 days) Do Old Exam Paper per day Compare with MEMO

TASK 6. (5 days) Draw ALL Sketches freehand as above.
For learning the Construction of the Sketches.